

AMMONIA, ANHYDROUS

AMA

CAUTIONARY RESPONSE INFORMATION

Common Synonyms Liquid ammonia	Liquefied compressed gas Colorless Ammonia odor
Floats and boils on water. Poisonous, visible vapor cloud is produced.	
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</p>	
Fire	<p>Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop flow of gas or liquid if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Will burn skin and eyes. Harmful if swallowed. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
 Stop discharge
 Do not add water to undissolved material

2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Currently not available; Ammonia
 2.2 **Formula:** NH₃
 2.3 **IMO/UN Designation:** /1005
 2.4 **DOT ID No.:** 1005
 2.5 **CAS Registry No.:** 7664-41-7
 2.6 **NAERG Guide No.:** 125
 2.7 **Standard Industrial Trade Classification:** 52261

3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Gas-tight chemical goggles, self-contained breathing apparatus, rubber boots, rubber gloves, emergency shower and eye bath.

3.2 **Symptoms Following Exposure:** 700 ppm causes eye irritation, and permanent injury may result if prompt remedial measures are not taken; 5000 ppm can cause immediate death from spasm, inflammation, or edema of the larynx. Contact of the liquid with skin freezes the tissue and then produces a caustic burn.

3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air and give artificial respiration if necessary. Oxygen may be useful. Observe for laryngeal spasm and perform tracheostomy if indicated. SKIN OR EYES: flood immediately with running water for 15 min. Treat subsequently as thermal burn.

3.4 **TLV-TWA:** 25 ppm.
 3.5 **TLV-STEL:** Not listed.
 3.6 **TLV-Ceiling:** 35 ppm.
 3.7 **Toxicity by Ingestion:** Not pertinent
 3.8 **Toxicity by Inhalation:** Currently not available.
 3.9 **Chronic Toxicity:** Not pertinent
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe eye or throat irritation and may cause eye or lung injury; vapors cannot be tolerated even at low concentrations.
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
 3.12 **Odor Threshold:** 46.8 ppm
 3.13 **IDLH Value:** 300 ppm.
 3.14 **OSHA PEL-TWA:** 50 ppm.
 3.15 **OSHA PEL-STEL:** Not listed.
 3.16 **OSHA PEL-Ceiling:** Not listed.
 3.17 **EPA AEGL:** Not listed

4. FIRE HAZARDS

4.1 **Flash Point:**
 Not flammable under conditions likely to be encountered

4.2 **Flammable Limits in Air:** 15.50%-27.00%

4.3 **Fire Extinguishing Agents:** Stop flow of gas or liquid. Let fire burn.

4.4 **Fire Extinguishing Agents Not to Be Used:** None

4.5 **Special Hazards of Combustion Products:** Not pertinent

4.6 **Behavior in Fire:** Not pertinent

4.7 **Auto Ignition Temperature:** 1204°F

4.8 **Electrical Hazards:** Class I, Group D

4.9 **Burning Rate:** 1 mm/min.

4.10 **Adiabatic Flame Temperature:** Currently not available

4.11 **Stoichiometric Air to Fuel Ratio:** 6.050 (Est.)

4.12 **Flame Temperature:** Currently not available

4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available

4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Dissolves with mild heat effect

5.2 **Reactivity with Common Materials:** Corrosive to copper and galvanized surfaces.

5.3 **Stability During Transport:** Stable

5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water

5.5 **Polymerization:** Not pertinent

5.6 **Inhibitor of Polymerization:** Not pertinent

6. WATER POLLUTION

6.1 **Aquatic Toxicity:**
 2.0 - 2.5 ppm/1-4 days/goldfish and yellow perch/LC
 60 - 80 ppm/3 days/crayfish/LC₅₀
 8.2 ppm/96 hr/fathead minnow/TL_m

6.2 **Waterfowl Toxicity:** 120 ppm

6.3 **Biological Oxygen Demand (BOD):** Not pertinent

6.4 **Food Chain Concentration Potential:** None

6.5 **GESAMP Hazard Profile:**
 Bioaccumulation: 0
 Damage to living resources: 2
 Human Oral hazard: 1
 Human Contact hazard: 1
 Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial, industrial, refrigeration, electronic, and metallurgical grades all have purity greater than 99.5%

7.2 **Storage Temperature:** Ambient for pressurized ammonia; low temperature for ammonia at atmospheric pressure

7.3 **Inert Atmosphere:** No requirement

7.4 **Venting:** Safety relief 250 psi for ammonia under pressure. Pressure-vacuum for ammonia at atmospheric pressure.

7.5 **IMO Pollution Category:** Currently not available

7.6 **Ship Type:** 2

7.7 **Barge Hull Type:** 2

8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Poison gas

8.2 **49 CFR Class:** 2.3

8.3 **49 CFR Package Group:** Not listed.

8.4 **Marine Pollutant:** No

8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** 100

8.7 **EPA Pollution Category:** B

8.8 **RCRA Waste Number:** Not listed

8.9 **EPA FWPCA List:** Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Gas

9.2 **Molecular Weight:** 17.03

9.3 **Boiling Point at 1 atm:** -28.1°F = -33.4°C = 239.8°K

9.4 **Freezing Point:** -108°F = -77.7°C = 265.5°K

9.5 **Critical Temperature:** 271.4°F = 133°C = 406.2°K

9.6 **Critical Pressure:** 1636 psia = 111.3 atm = 11.27 MN/m²

9.7 **Specific Gravity:** 0.682 at -33.4°C (liquid)

9.8 **Liquid Surface Tension:** Not pertinent

9.9 **Liquid Water Interfacial Tension:** Not pertinent

9.10 **Vapor (Gas) Specific Gravity:** 0.6

9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3 at 20°C

9.12 **Latent Heat of Vaporization:** 589 Btu/lb = 327 cal/g = 13.7 X 10⁵ J/kg

9.13 **Heat of Combustion:** -7992 Btu/lb = -4440 cal/g = -185.9 X 10⁵ J/kg

9.14 **Heat of Decomposition:** Not pertinent

9.15 **Heat of Solution:** -232 Btu/lb = -129 cal/g = -5.40 X 10⁵ J/kg

9.16 **Heat of Polymerization:** Not pertinent

9.17 **Heat of Fusion:** Currently not available

9.18 **Limiting Value:** Currently not available

9.19 **Reid Vapor Pressure:** 211.9 psia

NOTES

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-105	42.070	-75	1.041		N		N
-100	42.200	-70	1.043		O		O
-95	42.310	-65	1.046		T		T
-90	42.410	-60	1.049				
-85	42.500	-55	1.052		P		P
-80	42.570	-50	1.054		E		E
-75	42.630	-45	1.057		R		R
-70	42.680	-40	1.060		T		T
-65	42.720	-35	1.063		I		I
-60	42.740	-30	1.066		N		N
-55	42.750				E		E
-50	42.750				N		N
-45	42.730				T		T
-40	42.700						
-35	42.660						
-30	42.600						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-40	10.470	-40	0.03957	0	0.487
	I	-35	12.080	-35	0.04514	25	0.494
	S	-30	13.900	-30	0.05132	50	0.501
	C	-25	15.940	-25	0.05816	75	0.508
	I	-20	18.220	-20	0.06573	100	0.515
	B	-15	20.760	-15	0.07406	125	0.523
	L	-10	23.590	-10	0.08322	150	0.530
	E	-5	26.730	-5	0.09326	175	0.538
		0	30.210	0	0.10420	200	0.546
		5	34.040	5	0.11620	225	0.554
		10	38.270	10	0.12930	250	0.562
		15	42.920	15	0.14340	275	0.571
		20	48.020	20	0.15880	300	0.579
		25	53.600	25	0.17540	325	0.588
		30	59.690	30	0.19340	350	0.597
		35	66.330	35	0.21270	375	0.606
		40	73.549	40	0.23350	400	0.615
		45	81.400	45	0.25590	425	0.625
		50	89.900	50	0.27980	450	0.635
		55	99.099	55	0.30550	475	0.645
		60	109.000	60	0.33290	500	0.655
		65	119.700	65	0.36210	525	0.665
		70	131.299	70	0.39320	550	0.675
		75	143.699	75	0.42630	575	0.686
		80	157.000	80	0.46150	600	0.697
		85	171.199	85	0.49870		